

What is claimed is:

1. An implantable medical device system comprising:
  - a sensor to output a blood flow rate signal representing a rate of blood flow through a coronary sinus of a patient's heart;
  - 5 an implantable medical device (IMD) coupled to the sensor; and
  - a circuit embedded within the IMD configured to analyze the blood flow rate signal and detect a cardiac condition as a function of the blood flow rate signal.
- 10 2. The system of claim 1, wherein the cardiac condition includes ischemic heart disease.
- 15 3. The system of claim 1, wherein the cardiac condition includes a myocardial infarction.
4. The system of claim 1, wherein the cardiac condition includes a thrombus occluding a coronary artery.
- 20 5. The system of claim 1, wherein the microcomputer circuit is configured to determine a rate of change for the blood flow rate signal
- 25 6. The system of claim 1 further comprising an implantable lead to output a signal representing electrical activity sensed from the patient's heart, wherein the microcomputer circuit is configured to analyze the electrical activity signal and to detect the cardiac condition as a function of the blood flow rate signal and the electrical activity signal.
7. The system of claim 6, wherein the microcomputer circuit is configured to determine a rate of change for electrical activity signal.
- 30 8. The system of claim 6, wherein the microcomputer circuit monitors an ST segment of the electrical activity signal.

9. The system of claim 1 further comprising a drug deliver system to provide a therapeutic drug when the IMD detects the cardiac condition.

10. The system of claim 9, wherein the therapeutic drug is a thrombolytic.

5 11. The system of claim 1, wherein the sensor is integrated in a coronary sinus lead for implantation in the coronary sinus of a patient's heart.

10 12. The system of claim 1, wherein the IMD includes an alarm activated by the microcomputer circuit when the cardiac condition is detected.

13. The system of claim 12, wherein the alarm comprises an audible alarm.

14. The system of claim 12, wherein the alarm comprises a muscle-stimulating device.

15 15. The system of claim 1 further comprising a pacing lead coupled to the IMD, and further wherein the IMD comprises pacing control circuit to deliver pacing pulses as a function of the sensed blood flow rate signal and the sensed electrical activity.

20 16. The system of claim 1, wherein the microcomputer circuit is configured to log the sensed blood flow rate signal over a period of time, and further wherein the microcomputer circuit detects the cardiac condition by analyzing a trend of the blood flow rate signal.

25 17. The system of claim 1 and further including a defibrillation electrode to carry defibrillation pulses from the IMD to the patient's heart.

30 18. The system of claim 1, wherein the microcomputer circuit is configured to calculate the integral of the blood flow signal.

19. A method for pacing a patient's heart using an implanted medical device comprising:

sensing a rate of blood flow through a coronary sinus of a patient's heart;

detecting a cardiac condition as a function of the sensed blood flow.

5 20. The method of claim 19, wherein detecting the cardiac condition includes detecting ischemic heart disease.

21. The method of claim 19, wherein detecting the cardiac condition includes detecting a myocardial infarction.

10 22. The method of claim 19, wherein detecting the cardiac condition includes detecting a thrombus occluding a coronary artery.

23. The method of claim 19 further including calculating a rate of change for the blood flow.

15 24. The method of claim 19 further comprising:  
sensing electrical activity from a patient's heart; and  
detecting the cardiac condition as a function of the sensed blood flow through the coronary sinus and the sensed electrical activity.

20 25. The method of claim 24 further including calculating a rate of change for the sensed electrical activity.

25 26. The method of claim 24 further including analyzing an elevation for an ST segment of the sensed electrical activity.

27. The method of claim 19 further comprising delivering a therapeutic drug when the cardiac condition is detected.

30 28. The method of claim 19, wherein the therapeutic drug is a thrombolytic.

29. The method of claim 19 further including activating an alarm when the cardiac condition is detected.

30. The method of claim 29, wherein activating an alarm includes activating an audible alarm.

5 31. The method of claim 29, wherein activating an alarm includes activating a musclestimulating alarm.

32. The method of claim 19 further including deliver pacing pulses as a function of the sensed blood flow rate signal and the sensed electrical activity

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33. The method of claim 19 further including:  
logging the sensed blood flow rate signal over a period of time; and  
analyzing the log to detect the cardiac condition.

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34. The method of claim 19 further including calculating the integral of the sensed blood flow.

35. An implantable multi-chamber pacing system comprising:  
20 atrial sense means for sensing atrial signals from an atrium of a patient's heart;  
ventricular sense means for sensing ventricular signals from a patient's right ventricle;  
coronary sense means for sensing ventricular signals from the patient's left ventricle and for sensing a signal representing a blood flow rate through the patient's coronary sinus; and  
25 signal processing means for analyzing the ventricular signals, the atrial signals and the blood flow rate to detect a cardiac condition.

30 36. The pacing system of claim 35, wherein the signal processing means includes analyzing means for integrating the blood flow rate signal from the coronary sense means.

37. The pacing system of claim 35 and further including dispensing means for dispensing a therapeutic drug when the cardiac condition is detected.

38. The pacing system as described in claim 35, comprising programmer means for enabling the signal processing means.

39. The pacing system as described in claim 35, comprising defibrillation means for generating and providing a defibrillation pulse to the patient's heart.

40. An implantable medical device comprising:  
an input adapted to receive a blood flow signal representing a velocity of blood flowing through a coronary sinus of a patient's heart;  
an input adapted to receive a sensed signal representing electrical activity within the patient's heart;  
alarm circuitry; and  
a microcomputer circuit configured to activate the alarm circuitry as a function of the blood flow signal and the sensed electrical activity signal.

41. The device of claim 40, wherein microcomputer circuit is configured to compute the integral of the signal.

42. The device of claim 41 further including a digital controller/timer circuit configurable by the microcomputer circuit to output pacing stimuli as a function of the blood flow signal and the sensed electrical activity signal.

1000-24058001